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Health Technology Assessment Unit (TAU) of the MUHC



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Anesthesiologist Involvement in Gastrostomy Tube Insertion for Patients with Neurological Disorders

Evidence and Current Practice at the MUHC

Current Practice Re-evaluation
Report no. 110

Report prepared for the Technology Assessment Unit (TAU) of the McGill University Health Centre (MUHC)

by

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Mission Statement

The MUHC Health Technology Assessment Unit (TAU) advises hospital administrators and clinical teams in difficult resource allocation decisions. Using an approach based on independent, critical evaluations of the available scientific evidence and a transparent, fair decision-making process, novel and existing medical equipment, drugs and procedures used by healthcare professionals are prioritized on a continuous basis ensuring the best care for life with the best use of resources.

Declaration of Conflicts of Interest

Members of TAU's research staff and policy committee declare no conflicts of interest.

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FINDINGS AT A GLANCE

WHAT DID WE EVALUATE?

The need for anesthesiologist involvement during gastrostomy tube insertion in neurological patients via:

- A systematic review of available evidence and clinical guidance on anesthesiologist involvement, outcomes, and safety
- A description of current gastrostomy practices across three MUHC sites (RVH, MGH, MNH)

What does the evidence tell us about routine anesthesiologist presence?

WHAT THE PUBLISHED EVIDENCE SHOWS	OVERALL SIGNAL
No direct evidence establishes routine anesthesiologist involvement • Published guidance generally addresses the choice and depth of sedation in gastrostomy procedures, depending on procedure type, patient characteristics and anticipated procedural requirements. • However, **no guideline or comparative study identified in this review establishes a requirement for routine anesthesiologist presence** for all gastrostomy procedures or for all neurological patients.	NO DIRECT EVIDENCE

What influences clinical practice variation across MUHC sites?

FACTOR	WHAT WE OBSERVED AT THE MUHC
Gastrostomy procedural factors	**Procedure type and sedation requirements differ across sites** • PEG, RIG/PRG and PIG are distinct procedures requiring different levels of sedation. RIG and PIG can generally be performed with limited sedation. • **MNH is currently the only site with routine anesthesiologist involvement for all gastrostomy procedures**.
Patient factors	**Patient characteristics influence the need for additional support** • Medically fragile patients, including patients with advanced neuromuscular disease and significant respiratory dependence, require additional support in some cases. • However, **no formal patient-selection criteria were identified** to determine when anesthesiologist support is required.
Organizational factors	**Procedure volumes, expertise and resources differ across sites** These include: • Availability of nurses trained in sedation-related monitoring • Access to interventional radiology expertise and infrastructure • Ability to maintain competencies through sufficient procedural volume

TAU CONSIDERATIONS

The available evidence does not establish a universal requirement for anesthesiologist involvement during gastrostomy tube insertion. Variation across MUHC sites appears to reflect a combination of procedural, patient and organizational factors, as well as established local practice patterns.

We therefore recommend consideration of the following:

- Standardize risk-based criteria for anesthesiologist involvement
- Explore cross-site nursing competency maintenance
- Explore transfer of selected patients to MGH/RVH to optimize expertise and resources.

TABLE OF CONTENTS

Findings at a glance iii
Table of Contents iv
List of Tables and figures v
List of Abbreviations vi
Acknowledgements vii
Report Requestor vii
Executive Summary viii
Sommaire xiii
1. Background 1
1.1 Reason for the request 1
2. Policy and Evaluation questions 2
2.1 Policy question 2
2.2 Evaluation questions (objectives of this report) 2
3. Methods 2
3.1 Evidence review 2
3.2 Review of current practice 3
4. Results 4
4.1 Literature review of available evidence 4
4.2 Review of current practice 6
5. Discussion 8
5.1 What does the evidence establish? 8
5.2 What does current MUHC practice suggest? 8
5.3 Clinical risk versus organizational model 8
5.4 Considerations for a standardized approach 9
6. Conclusions 9
7. TAU Considerations 10
Appendices 12
References 19

LIST OF TABLES AND FIGURES

Table 1. Gastrostomy techniques 1
Table 2. PICO elements for selecting studies..... 3
Table 3. Gastrostomy practices across the three MUHC sites 6

LIST OF ABBREVIATIONS

Abbreviation	Definition
ALS	Amyotrophic Lateral Sclerosis
ASA	The American Society of Anesthesiologists Physical Status Classification System is a standardized six-level scoring system used to assess and communicate a patient's pre-anesthesia medical comorbidities and estimate perioperative risk
CHUM	Centre hospitalier de l'Université de Montréal
MGH	Montreal General Hospital
MNH	Montreal Neurological Hospital
MUHC	McGill University Health Centre
PEG	Percutaneous endoscopic gastrostomy
PIG	Per-oral image-guided gastrostomy
RIG	Radiologically inserted gastrostomy
RVH	Royal Victoria Hospital
TAU	Technology Assessment Unit

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REPORT REQUESTOR

To support practice standardization across sites, Dr. Marc Beique, Associate Director- Hospital Fluidity, Directorate of Professional Service of the MUHC, requested the health technology assessment unit (TAU) to evaluate the available evidence regarding anesthesiology support, defined as the presence of an anesthesiologist, for enteral gastrostomy procedures in patients with neurological disorders at the McGill University Health Centre (MUHC).

EXECUTIVE SUMMARY

BACKGROUND

Gastrostomy tubes provide long-term enteral access for patients who are unable to maintain adequate oral nutrition or hydration. The principal techniques are percutaneous endoscopic gastrostomy (PEG), radiologically inserted gastrostomy (RIG/PRG), and per-oral image-guided gastrostomy (PIG). These techniques differ in procedural approach and may differ in their requirements for sedation, airway management and personnel.

A practice variation has been identified at the MUHC regarding the use of anesthesiologist support during gastrostomy insertion, which is currently routine practice at the Montreal Neurological Hospital (MNH). This variation prompted a TAU assessment of whether routine anesthesiologist involvement is necessary for patients with neurological disorders undergoing gastrostomy.

ORGANIZATIONAL POLICY QUESTION

Is the presence of an anesthesiologist clinically indicated for gastrostomy procedures in patients with neurological disorders?

EVALUATION QUESTIONS (Objectives of this report)

This review sought to evaluate the following:

1. What does the literature and available clinical guidance indicate regarding sedation/anesthesia requirements, including need for anesthesiologist involvement, for gastrostomy insertion in neurological patients?
2. What is the available evidence on clinical outcomes associated with PEG, RIG or PIG performed with versus without anesthesiologist involvement in patients with neurological disorders?
3. What is the available evidence regarding the safety of performing PEG, RIG or PIG without anesthesiologist involvement in patients with neurological disorders?
4. How does current MUHC practice compare across sites and with relevant external practice?

METHODS

Literature review

A systematic literature search was conducted in July 2026 by a MUHC librarian across medical databases and the grey literature for the following PICO. Relevant clinical guidelines were also reviewed.

Population	Adults with neurological disorder requiring feeding tube insertion through gastrostomy such as: • PEG (percutaneous endoscopic gastrostomy) • RIG (radiologically inserted gastrostomy)/PRG (Percutaneous radiologic gastrostomy) • PIG Per-oral image-guided gastrostomy)
Intervention	PEG, RIG or PIG performed in the absence of an anesthesiologist
Comparator	PEG, RIG or PIG performed in the presence of an anesthesiologist
Outcome	**Primary outcomes**: patient comfort; physician convenience; respiratory distress; bleeding; complications **Secondary outcome**: oxygen saturation
Study design	Systematic review and meta-analysis, RCT, observational studies

Review of current practice

The evidence review was complemented by surveys and interviews with MUHC clinicians involved in gastrostomy insertion and/or anesthesiology across three MUHC sites: Royal Victoria Hospital (RVH), Montreal General Hospital (MGH), and MNH. We also obtained information on local practice at the Centre hospitalier de l'Université de Montréal (CHUM) from their Interventional Endoscopy service.

RESULTS

Literature review of available evidence

Safety and clinical outcomes with versus without anesthesiologist involvement

- The literature search identified 1,728 records, of which five full-text articles were assessed for eligibility.
- **No studies met the inclusion criteria** because the identified articles did not address the specified intervention/comparator.

Sedation staffing requirements for gastrostomy procedures

- Several relevant guidelines were identified, including guidelines from the American and European gastroenterology societies and the European Academy of Neurology.
- None of the identified guidelines specified that sedation for gastrostomy performed without general anesthesia must be administered by an anesthesiologist, nor did they recommend routine anesthesiologist involvement solely on the basis of a neurological diagnosis. Rather, anesthesiologist involvement is generally determined according to patient risk, procedural requirements, sedation depth and local expertise.
- The guidance does not establish that the absence of an anesthesiologist means that the procedural physician is working alone; rather it emphasizes a team-based approach and appropriately trained team members for sedation administration and monitoring. When sedation is administered by the procedural operator, a second appropriately trained team member, usually a qualified nurse, should be dedicated to patient monitoring. Deeper levels of sedation, including deep sedation or propofol-based sedation, may require dedicated anesthesia personnel.

Overall, the available literature does not establish either a clinical benefit from routine anesthesiologist involvement or a universal requirement for anesthesiologist presence during gastrostomy in patients with neurological disorders. Importantly, the absence of a recommendation for routine anesthesiologist involvement does not establish that anesthesiologist involvement is unnecessary for individual high-risk patients, nor should it be interpreted as evidence that gastrostomies can be performed by the procedural physician alone; appropriately trained personnel for sedation and patient monitoring remain an important component of care.

Current practice across MUHC sites

Practice differs substantially across the three MUHC sites.

Gastrostomy procedural factors:

- **RVH** performs PEG and RIG, with sedation administered by registered nurses with basic training in sedation administration. Anesthesiologist involvement is reserved for selected situations, including anticipated difficult airway, severe respiratory disease, severe obstructive sleep apnea, previous failed sedation or inability to cooperate.
- **MGH** performs RIG and PIG, with sedation administered by nurses trained in sedation procedures. Anesthesiologist is involved for selected patients, including those with progressive or severe neurological/neurodegenerative disease, failed moderate sedation requiring opioids or inability to cooperate.
- **MNH** performs RIG and PIG through Interventional Radiology. **It is currently the only site with routine anesthesiologist involvement for all gastrostomy procedures**.

Patient factors:

- The MNH population is reported to have more medically complex/high-risk patients, such as those with severe neurological or neuromuscular impairment, compared to the RVH and MGH. However, the available information does not establish that patients at RVH/MGH are inherently at lower risk, nor does it provide a validated threshold for determining when anesthesiologist involvement is required.

Organizational factors:

- Sites also differ in local organizational factors, including nursing competencies, interventional radiology expertise and infrastructure, and procedural volume needed to maintain competencies

Thus, the variation across sites appears to reflect differences in procedural, patient and organizational factors, rather than a single MUHC-wide approach to anesthesiologist involvement.

CHUM experience

- Data provided by the interventional endoscopy service indicate that a higher proportion of gastrostomy procedures are performed endoscopically than radiologically.

- For patients with neurological disorders, an ASA assessment is routinely performed; the majority are classified as ASA III.
- In patients with amyotrophic lateral sclerosis, sedation is administered by nursing staff under physician orders, with medications selected according to the patient's clinical condition.
- The nursing staff responsible for administering sedation have basic nursing qualification, supplemented by additional training in sedation administration and post-procedure monitoring.
- Significant cardiorespiratory events occurring during or shortly after the gastrostomy are reportedly rare.

This represents a different model of care in which anesthesiologist involvement is not routinely required solely on the basis of a neurological diagnosis. However, differences in patient characteristics, procedural approaches, sedation practices, staffing models and available resources should be considered when interpreting differences between institutions.

CONCLUSIONS

- The systematic review identified **no direct comparative evidence** establishing whether gastrostomy procedures in patients with neurological disorders have better outcomes when performed with anesthesiologist involvement, or establishing the safety of performing these procedures without such support.
- Relevant guidelines similarly do not mandate anesthesiologist presence, instead emphasizing appropriate sedation according to patient characteristics, procedure and local expertise. Importantly, **the absence of a recommendation for routine anesthesiologist involvement does not preclude involvement for individual high-risk patients, and does not imply that gastrostomy can be performed by the procedural physician alone; appropriately trained personnel for sedation and monitoring remain essential.**
- At the MUHC, practice varies considerably across sites, with routine anesthesiologist involvement at MNH whereas RVH and MGH use nurse-administered sedation with selective anesthesiologist involvement. This variation occurs in the context of differences in patient risk, procedure volumes, expertise and organizational models.
- **Overall, the available evidence does not establish a clinical benefit from routine anesthesiologist involvement or provide a validated threshold for determining when it is required.** The evidence supports a risk-based, team-based approach to sedation and monitoring.

BEST PRACTICE CONSIDERATIONS

The available evidence does not establish a universal requirement for anesthesiologist involvement during gastrostomy tube insertion. Variation across MUHC sites appears to reflect a combination of procedural, patient and organizational factors, as well as established local practice patterns.

We therefore recommend consideration of the following:

1. Risk-based anesthesiologist involvement

The evidence does not establish a universal requirement or clinical benefit for anesthesiologist involvement during gastrostomy for neurological patients. At the same time, MNH serves a population with a higher proportion of patients classified as ASA III–IV, and some patients may have significant respiratory, airway or neurological vulnerability.

A standardized MUHC approach could therefore consider **risk-based criteria for anesthesiologist involvement**, incorporating respiratory/airway risk, anticipated sedation requirements, patient ability to cooperate, previous sedation difficulties, procedural complexity, and local resources.

2. Maintaining sedation competencies

The relatively low volume of gastrostomy procedures at MNH presents a challenge for maintaining nursing competencies in sedation-related care. One potential approach would be to maintain these competencies through participation in other procedures requiring sedation at MNH and/or through training and clinical exposure at RVH or MGH.

3. Inter-site care pathways

For selected neurologically stable patients who can be safely transported, the MUHC could explore the feasibility of **transferring patients from MNH to MGH/RVH for gastrostomy placement by the GI/IR team**. This could leverage existing expertise and nursing sedation competencies at MGH/RVH. Such a pathway would require assessment of patient eligibility, transport considerations, procedural capacity and coordination between sites.

SOMMAIRE

Présence de l'anesthésiologiste lors des interventions de gastrostomie chez les patients atteints de troubles neurologiques : données probantes et pratiques actuelles au CUSM

CONTEXTE

Les sondes de gastrostomie assurent un accès entéral à long terme pour les patients incapables de maintenir une nutrition ou une hydratation orale adéquate. Les principales techniques sont la gastrostomie endoscopique percutanée (PEG), la gastrostomie par voie radiologique (RIG) et la gastrostomie par voie orale guidée par imagerie (PIG). Ces techniques diffèrent par leur approche procédurale ainsi que par les besoins en matière de sédation, de gestion des voies respiratoires et de personnel.

Une variation des pratiques a été relevée au CUSM concernant le recours à un anesthésiologiste lors de la pose d'une gastrostomie, une pratique actuellement systématique à l'Hôpital neurologique de Montréal (HNM). Ce constat a motivé une évaluation par l'unité TAU visant à déterminer si la participation systématique d'un anesthésiologiste est nécessaire pour les patients atteints de troubles neurologiques devant subir une gastrostomie.

QUESTION DÉCISIONNELLE

La présence d'un anesthésiologiste est-elle cliniquement indiquée pour les interventions de gastrostomie chez les patients atteints de troubles neurologiques ?

QUESTIONS D'ÉVALUATION (Objectifs du présent rapport)

Cette revue visait à évaluer les points suivants :

1. Que indiquent la littérature et les directives cliniques disponibles concernant les besoins en matière de sédation ou d'anesthésie, y compris la nécessité de faire appel à un anesthésiologiste, pour la pose d'une gastrostomie chez les patients atteints d'affections neurologiques ?
2. Quelles sont les données probantes disponibles sur les résultats cliniques associés à la PEG, à la RIG ou à la PIG réalisées avec ou sans l'intervention d'un anesthésiologiste chez les patients atteints de troubles neurologiques ?
3. Quelles sont les données probantes disponibles concernant la sécurité de la réalisation d'une PEG, d'une RIG ou d'une PIG sans l'intervention d'un anesthésiologiste chez les patients atteints de troubles neurologiques ?
4. Comment les pratiques actuelles du CUSM se comparent-elles entre les différents sites ainsi qu'avec les pratiques externes pertinentes ?

MÉTHODES

Revue de la littérature

Une recherche documentaire systématique a été effectuée en juillet 2026 par unE bibliothécaire du CUSM dans des bases de données médicales et la littérature grise, en fonction de la question PICO suivante. Les lignes directrices cliniques pertinentes ont également été examinées.

Population	Adultes atteints d'un trouble neurologique nécessitant la pose d'une sonde d'alimentation par gastrostomie, telle que : • PEG (gastrostomie endoscopique percutanée) • RIG (gastrostomie par voie radiologique) / PRG (gastrostomie radiologique percutanée) • PIG (gastrostomie par voie orale guidée par imagerie)
Intervention	PEG, RIG or PIG réalisée en l'absence d'anesthésiste
Comparateur	PEG, RIG or PIG réalisée en présence d'un anesthésiste
Résultats	**Résultats principaux** : confort du patient ; commodité pour le médecin ; détresse respiratoire ; saignement ; complications **Résultat secondaire** : saturation en oxygène
Type d'étude	Revue systématique et méta-analyse, ECR, études observationnelles

Examen des pratiques actuelles

L'examen des données probantes a été complété par des enquêtes et des entretiens auprès de cliniciens du CUSM participant à la pose de gastrostomies et/ou à l'anesthésie sur trois sites de l'établissement : l'Hôpital Royal Victoria (HRV), l'Hôpital général de Montréal (HGM) et le HNM. Nous avons également recueilli des informations sur les pratiques locales au Centre hospitalier de l'Université de Montréal (CHUM) auprès de leur service d'endoscopie interventionnelle.

PRINCIPAUX RÉSULTATS

Examen de la littérature et des données probantes disponibles

<u>Sécurité et résultats cliniques avec ou sans la participation d'un anesthésiologiste</u>

- La recherche documentaire a permis d'identifier 1 728 références, dont cinq articles en texte intégral ont été évalués pour déterminer leur admissibilité.
- **Aucune étude ne répondait aux critères d'inclusion**, car les articles identifiés ne portaient pas sur l'intervention ou le comparateur spécifiés.

<u>Exigences en matière de personnel pour la sédation lors des interventions de gastrostomie</u>

- Plusieurs lignes directrices pertinentes ont été identifiées, notamment celles émanant de sociétés de gastro-entérologie américaines et européennes ainsi que de l'Académie européenne de neurologie.
- Aucune ne stipulait que la sédation pour une gastrostomie réalisée sans anesthésie générale devait être administrée par un anesthésiologiste, ni ne recommandait l'intervention systématique d'un anesthésiologiste sur la seule base d'un diagnostic

neurologique. L'intervention d'un anesthésiologiste est plutôt généralement déterminée en fonction du risque lié au patient, des exigences de l'intervention, de la profondeur de la sédation et de l'expertise locale.

- Ces recommandations n'établissent pas que l'absence d'anesthésiologiste implique que le médecin réalisant l'intervention travaille seul ; elles privilégient au contraire une approche d'équipe et la présence de membres du personnel dûment formés pour l'administration et la surveillance de la sédation. Lorsque la sédation est administrée par le médecin effectuant l'intervention, un second membre de l'équipe dûment formé, généralement un infirmier qualifié, doit être affecté à la surveillance du patient. Des niveaux de sédation plus profonds, notamment la sédation profonde ou la sédation au propofol, peuvent nécessiter la présence de personnel d'anesthésie dédié.

Dans l'ensemble, la littérature disponible ne démontre ni bénéfice clinique lié à l'intervention systématique d'un anesthésiste, ni nécessité absolue de sa présence lors de la réalisation d'une gastrostomie chez les patients atteints de troubles neurologiques. Il convient toutefois de souligner que l'absence de recommandation en faveur d'une participation systématique de l'anesthésiologiste n'exclut pas son intervention pour certains patients à haut risque, et ne signifie pas pour autant que le médecin réalisant l'intervention peut agir seul ; la présence de personnel dûment formé pour assurer la sédation et la surveillance demeure indispensable.

Pratiques actuelles dans les différents sites du CUSM

Les pratiques diffèrent considérablement entre les trois sites du CUSM.

Facteurs liés à la procédure de gastrostomie :

- **L'HRV** réalise les PEG et les RIG, la sédation étant administrée par des infirmières ayant une formation de base en administration de sédation. L'intervention d'un anesthésiologiste est réservée à certaines situations, notamment en cas de difficultés respiratoires anticipées, de maladie respiratoire grave, d'apnée obstructive du sommeil sévère, d'échec de sédation antérieur ou d'incapacité du patient à coopérer.
- **L'HGM** réalise les RIG et les PIG, la sédation étant administrée par des infirmières ayant une formation de base en administration de sédation. Un anesthésiologiste intervient pour certains patients, notamment ceux atteints d'une maladie neurologique ou neurodégénérative progressive ou grave, en cas d'échec d'une sédation modérée nécessitant des opioïdes ou en cas d'incapacité du patient à coopérer.
- **L'HNM** réalise les RIG et les PIG par l'entremise du service de radiologie interventionnelle. **Il s'agit actuellement du seul site où l'intervention d'un anesthésiologiste est systématique pour toutes les gastrostomies**.

Facteurs liés aux patients :

- La population du HNM comprendrait davantage de patients présentant des problèmes de santé complexes ou à haut risque, notamment ceux souffrant d'une atteinte neurologique ou neuromusculaire grave, comparativement au HRV et au HGM. Toutefois, les données disponibles ne permettent pas d'établir que les patients du HRV ou du HGM présentent intrinsèquement un risque plus faible, ni de définir un seuil validé pour déterminer quand l'intervention d'un anesthésiologiste est requise.

Facteurs organisationnels :

- Les sites diffèrent également par leurs facteurs organisationnels locaux, notamment les compétences infirmières, l'expertise et l'infrastructure en radiologie interventionnelle, ainsi que le volume d'interventions nécessaire au maintien des compétences.

Ainsi, la variation observée entre les sites semble refléter des différences au niveau des procédures, des patients et de l'organisation, plutôt qu'une approche unique du CUSM concernant l'intervention des anesthésiologistes.

Expérience du CHUM

- Les données fournies par le service d'endoscopie interventionnelle indiquent qu'une plus grande proportion d'actes de gastrostomie est réalisée par voie endoscopique que par voie radiologique.
- Pour les patients atteints de troubles neurologiques, une évaluation ASA est systématiquement réalisée ; la majorité d'entre eux sont classés ASA III.
- Chez les patients atteints de sclérose latérale amyotrophique, la sédation est administrée par le personnel infirmier sur prescription médicale, à l'aide de médicaments tels que le midazolam ou le fentanyl, en fonction de l'état général du patient.
- Le personnel infirmier chargé de l'administration de la sédation possède une qualification infirmière de base, complétée par une formation spécifique en endoscopie couvrant l'administration de la sédation et la surveillance post-interventionnelle.
- Les événements cardiorespiratoires significatifs survenant pendant ou peu après la gastrostomie (par exemple, désaturation ou nécessité d'une intervention sur les voies aériennes, hypotension, arythmie) sont rares.

Il s'agit d'un modèle de soins dans lequel l'intervention d'un anesthésiologiste n'est pas systématiquement requise sur la seule base d'un diagnostic neurologique. Toutefois, il convient de prendre en compte les différences relatives aux caractéristiques des patients, aux approches procédurales, aux pratiques de sédation, aux modèles de dotation en personnel et aux ressources disponibles lors de l'interprétation des écarts entre les établissements.

CONCLUSIONS

- La revue systématique n'a mis en évidence **aucune donnée comparative directe** permettant d'établir si les interventions de gastrostomie chez les patients atteints de troubles neurologiques donnent de meilleurs résultats lorsqu'elles sont réalisées avec la participation d'un anesthésiologiste, ni de confirmer la sécurité de ces interventions en l'absence d'un tel soutien.
- De même, les lignes directrices pertinentes n'imposent pas la présence d'un anesthésiologiste ; elles privilégient plutôt une sédation adaptée aux caractéristiques du patient, à l'intervention et à l'expertise locale. **Il convient de noter que l'absence de recommandation en faveur d'une participation systématique de l'anesthésiologiste n'exclut pas son intervention pour certains patients à haut risque, et ne signifie pas pour autant que le médecin réalisant l'intervention peut agir seul ; la présence de personnel dûment formé pour assurer la sédation et la surveillance demeure indispensable.**
- Au CUSM, les pratiques varient considérablement d'un site à l'autre : la présence d'un anesthésiologiste est systématique à l'HNM, tandis que l'HRV et l'HGM ont recours à une sédation administrée par le personnel infirmier, avec une participation ponctuelle de l'anesthésiologiste. Cette variation s'explique par les différences de risque pour le patient, de volume d'interventions, d'expertise et de modèles organisationnels.
- **Dans l'ensemble, les données disponibles ne démontrent pas de bénéfice clinique lié à la participation systématique d'un anesthésiologiste ni n'établissent de seuil validé pour déterminer quand cette présence est requise.** Les données probantes favorisent une approche de la sédation et de la surveillance fondée sur l'évaluation des risques et le travail d'équipe.

CONSIDÉRATIONS RELATIVES AUX MEILLEURES PRATIQUES

Les données probantes disponibles n'établissent pas d'exigence universelle quant à la participation d'un anesthésiologiste lors de la pose d'une sonde de gastrostomie. Les variations observées entre les sites du CUSM semblent résulter d'une combinaison de facteurs liés à l'intervention, au patient et à l'organisation, ainsi que des pratiques locales établies.

Nous recommandons donc de prendre en compte les éléments suivants :

1. **Participation de l'anesthésiologiste fondée sur le risque**

   Les données probantes n'établissent ni exigence universelle ni avantage clinique justifiant la participation d'un anesthésiologiste lors d'une gastrostomie chez les patients neurologiques. Toutefois, le HNM dessert une population comptant une proportion plus élevée de patients classés ASA III ou IV, et certains d'entre eux peuvent présenter une vulnérabilité respiratoire, neurologique ou liée aux voies aériennes importante.

   Une approche normalisée au sein du CUSM pourrait donc envisager des **critères fondés sur le risque** pour déterminer la nécessité de faire appel à un anesthésiologiste, en tenant compte des risques respiratoires ou liés aux voies aériennes, des besoins prévus en matière de sédation, de la capacité de coopération du patient, des antécédents de difficultés liées à la sédation, de la complexité de l'intervention et des ressources locales.

2. **Maintien des compétences en matière de sédation**

   Le volume relativement faible d'interventions de gastrostomie au HNM pose un défi pour le maintien des compétences du personnel infirmier en ce qui a trait aux soins liés à la sédation. Une approche possible consisterait à maintenir ces compétences en participant à d'autres interventions nécessitant une sédation au HNM et/ou par le biais de formations et d'une expérience clinique au HRV ou au HGM.

3. **Parcours de soins intersites**

   Pour certains patients neurologiquement stables pouvant être transportés en toute sécurité, le CUSM pourrait **étudier la possibilité de les transférer du HNM vers le HGM ou le HRV** afin qu'une gastrostomie y soit posée par l'équipe de gastro-entérologie et/ou de radiologie interventionnelle. Cette approche permettrait de tirer parti de l'expertise et des compétences du personnel infirmier en matière de sédation déjà présentes au HGM et au HRV. Un tel parcours nécessiterait toutefois d'évaluer l'admissibilité des patients, les modalités de transport, la capacité opérationnelle pour l'intervention ainsi que la coordination entre les différents sites.

Anesthesiologist Involvement in Gastrostomy Tube Insertion for Patients with Neurological Disorders: Evidence and Current Practice at the MUHC

1. BACKGROUND

- Gastrostomy is commonly used to provide long-term enteral access in patients with neurological disease, neuromuscular disorders, malignancy and other conditions associated with inadequate oral intake.[1]
- The three principal gastrostomy techniques are described in Table 1. Although these procedures share the same objective, their procedural requirements and approaches to sedation may differ (Appendix Table A-1).[2]

Table 1. Gastrostomy techniques

Technique	Procedural approach	Anesthesia/sedation	Typical setting
Percutaneous endoscopic gastrostomy (PEG)	Endoscopic placement through the stomach	Conscious sedation (e.g., midazolam + pethidine)	Gastroenterology/endoscopy
Radiologically inserted gastrostomy (RIG)/PRG	Image-guided placement without endoscopy	Can be done with local anesthesia alone	Interventional Radiology
Per-oral image-guided gastrostomy (PIG)	Image-guided placement using an orally introduced guidewire	Can be done with minimal sedation or local anesthetic alone	Interventional Radiology

- Greater anesthesiology support or the presence of an anesthesiologist is based on the patient's ability to tolerate: [1,3]
    - the required positioning;
    - the procedure and associated discomfort;
    - sedation and its effects on respiratory drive;
    - airway compromise or aspiration;
    - changes in oxygenation or ventilation; and
    - procedural complications requiring escalation of care.

1.1 Reason for the request

A practice variation has been identified at the MUHC regarding the use of anesthesiologist involvement during gastrostomy insertion, which is currently routine practice at the Montreal Neurological Hospital (MNH). This variation prompted a TAU assessment to evaluate the

available evidence on the need for routine anesthesiologist involvement for patients with neurological disorders undergoing gastrostomy, with the eventual goal of supporting practice standardization across sites.

2. POLICY AND EVALUATION QUESTIONS

2.1 Policy question

Is the presence of an anesthesiologist clinically indicated for gastrostomy procedures in patients with neurological disorders?

2.2 Evaluation questions (objectives of this report)

This review sought to evaluate the following:

1. What does the literature and available clinical guidance indicate regarding sedation/anesthesia requirements, including need for anesthesiologist involvement, for gastrostomy insertion in neurological patients?
2. What is the available evidence on clinical outcomes associated with PEG, RIG or PIG performed with versus without anesthesiologist involvement in patients with neurological disorders?
3. What is the available evidence regarding the safety of performing PEG, RIG or PIG without anesthesiologist involvement in patients with neurological disorders?
4. How does current MUHC practice compare across sites and with relevant external practice?

3. METHODS

3.1 Evidence review

A systematic literature search was conducted by a MUHC librarian in Cochrane Library, Embase, MEDLINE and PubMed, supplemented by searches of Epistemonikos, Centre for Reviews and Dissemination (CRD), CADTH, INESSS, the Quebec UETMISSS library and the HTA Database. Relevant guidelines and reference lists were also reviewed. The MEDLINE strategy (Table B-1) was applied to all databases, with modifications to search terms as necessary. The search was conducted in July 2026 and was limited to adults, without language restrictions.

3.1.1 Study selection process and PICO

Studies were eligible if they compared the efficacy or safety of conscious sedation performed by an anesthesiologist versus conscious sedation performed by a non-anesthesiologist (nurse or non-anesthesiologist physician) in adult patients with neurological disorders. Case studies or case series were excluded. Selection was restricted to full-text articles in English or French.

Study selection was conducted by one reviewer (TO). The articles were first screened by titles and abstracts according to predefined inclusion criteria summarise in Table 2. Subsequently, reading of full text of selected articles was done to determine their eligibility.

Table 2. PICO elements for selecting studies

	Inclusion criteria
Population	Adults with neurological disorder requiring feeding tube insertion through gastrostomy such as: • PEG (percutaneous endoscopic gastrostomy) • RIG (radiologically inserted gastrostomy) also known as PRG (Percutaneous radiologic gastrostomy) • PIG Per-oral image-guided gastrostomy)
Intervention	PEG, RIG or PIG performed in the absence of an anesthesiologist
Comparator	PEG, RIG or PIG performed in the presence of an anesthesiologist
Outcome	**Primary outcomes**: • patient's comfort • physician's convenience • respiratory distress • bleeding • complications **Secondary outcome**: • oxygen saturation
Study design	Systematic review and meta-analysis, RCT, observational studies

3.2 Review of current practice

3.2.1 Current practice across MUHC sites

Current practice was reviewed through correspondence, semi-structured interviews, and online surveys with local clinical and operational experts across the Royal Victoria Hospital (RVH), Montreal General Hospital (MGH), and Montreal Neurological Hospital (MNH). The local experts consulted included physicians from anesthesiology and diagnostic/interventional radiology, as well as nursing leaders, nurse clinicians, nurse managers, and nursing professional development educators from gastroenterology,

endoscopy, medical imaging, and interventional radiology. The list of experts consulted, interview themes, and survey questions are provided in Appendix Table C-1, Table C-2 and Table C-3, respectively.

3.2.2 Current practice at the CHUM

We corresponded with Dr. Michel Boivin, Medical Head of Diagnostic and Interventional Endoscopy at the Centre hospitalier de l'Université de Montréal (CHUM) about their gastrostomy practices.

4. RESULTS

4.1 Literature review of available evidence

4.1.1 Evidence addressing sedation and anesthesia level in gastrostomy procedures

- The level of sedation is clinically relevant because increasing sedation may increase the potential for respiratory depression and airway compromise, particularly in patients with limited respiratory reserve.
- Available guidance indicates that gastrostomy procedures can be undertaken using different levels of anesthesia or sedation, depending on the procedure and patient (Appendix Table A-1).[1,4-8]
- Radiologically inserted gastrostomy (RIG) generally requires less sedation than endoscopic gastrostomy. Local anesthesia may therefore be sufficient for some radiologically inserted gastrostomies, while sedation may be added according to patient tolerance and procedural requirements. PEG commonly involves sedation because of the endoscopic component.[1,4,6]

4.1.2 Evidence addressing sedation staffing requirements during gastrostomy procedures in neurological patients

- Neurological and neuromuscular patients may present additional challenges for sedation because of dysphagia, impaired airway protection, respiratory muscle weakness, abnormal respiratory mechanics or dependence on non-invasive ventilation.[3,5]
- Several relevant guidelines were identified, including guidelines from the American and European gastroenterology societies and the European Academy of Neurology.[1,3,4,6-9]
- **For gastrostomy procedures performed *without general anesthesia*, none of the identified guidelines specified that sedation must be administered by an anesthesiologist, and no guideline recommended routine anesthesiologist involvement**

solely on the basis of a neurological diagnosis. Rather, guidance generally supports selecting the sedation and monitoring approach according to patient clinical characteristics, procedure and local expertise, including availability of appropriately trained personnel.

- Guidance also emphasizes that sedation and monitoring should be provided by appropriately trained personnel. Where the procedural operator administers sedation, British Society of Gastroenterology guidance recommends a second appropriately trained team member, usually a qualified nurse, who is dedicated to monitoring the patient's clinical status and level of sedation.[6] For deeper levels of sedation, including deep sedation or propofol-based sedation, guidance recommends dedicated anesthesia personnel and additional trained support. **Therefore, sedated procedures are generally undertaken within a team-based model, often requiring a second trained team member and appropriately trained personnel responsible for monitoring and administering sedation.**

4.1.3 Evidence specific to clinical outcomes and safety of PEG, RIG or PIG performed with versus without physician anesthesiology support in neurological patients

- The literature search identified 1,728 records, of which five full-text articles were assessed for eligibility (Appendix Figure B-1).
- **No studies met the inclusion criteria**, because the identified articles did not address the specified intervention/comparator.

4.1.4 Summary of the evidence

- The available literature does not establish either a clinical benefit from routine anesthesiologist involvement or a universal requirement for anesthesiologist presence during gastrostomy in patients with neurological disorders.
- The guidance does not establish that the absence of an anesthesiologist means that the procedural physician is working alone. Sedated procedures are generally undertaken within a team-based model, with guidance indicating that a second operator or assistant may be required in addition to the primary operator, and with appropriately trained personnel responsible for monitoring and administering sedation.
- The available literature supports individualized risk assessment, but does not provide a validated threshold for anesthesiologist involvement in gastrostomy procedures.
- Importantly, the absence of a recommendation for routine anesthesiologist involvement does not establish that anesthesiologist involvement is unnecessary for individual high-risk patients, nor should it be interpreted as evidence that gastrostomies can be performed by the procedural physician alone; appropriately trained personnel for sedation and patient monitoring remain an important component of care.

4.2 Review of current practice

4.2.1 Overview of practice across MUHC sites

Practice differs substantially across the three MUHC sites (Table 3).

Table 3. Gastrostomy practices across the three MUHC sites

Aspect	RVH	MGH	MNH
Procedures performed	PEG and RIG	RIG and PIG	RIG and PIG
Primary operator	Gastroenterology (PEG); IR (RIG)	IR (RIG/PIG)	IR (RIG/PIG)
Annual volume [a]	PEG: 51–100/year; RIG: 51–100/year	~80–100/year: ~60 RIG, ~40 PIG	~52–54/year
Patient distributions[b]	<25% ASA III-IV	<25% ASA III-IV	>75% ASA III-IV
Sedation provider	Registered Nurse [c] for both PEG and RIG	Registered Nurse [c]	Anesthesiologist routinely involved for all RIG/PIG procedures
Monitoring	Registered Nurse	Registered Nurse	Anesthesiologist
Anesthesiologist involvement	PEG: Only for GA RIG: Cases with anticipated difficult airway, severe respiratory disease, severe OSA, failed previous sedation, patient unable to cooperate	Cases with progressive or severe neurologic/ neurodegenerative disorders, failed moderate sedation that required opioids, patient unable to cooperate	All RIG/PIG procedures
General anesthesia use	PEG: <10% RIG: 10-25%	10–25%	Unknown

[a] Based on fiscal year report [b] ASA: The American Society of Anesthesiologists (ASA) Physical Status Classification System. These figures represent approximate, nurse-reported estimates rather than systematically assessed ASA classifications, as ASA status is not routinely or formally documented for all patients. [c] Nurses are required to complete conscious sedation certification, BLS/ CPR, and procedural competency training to administer sedation and continuous monitoring during gastrostomy procedures. The procedure training includes online theory on the ENA platform and six weeks of shadowing.

Gastrostomy procedural factors:

- **RVH** performs PEG and RIG, with sedation administered by registered nurses with training in sedation procedures. Anesthesiologist involvement is reserved for selected situations, including anticipated difficult airway, severe respiratory disease, severe obstructive sleep apnea, previous failed sedation or inability to cooperate.
- **MGH** performs RIG and PIG, also with trained nurse-administered sedation. Anesthesiologist involvement is for selected patients, including those with progressive or severe neurological/neurodegenerative disease, failed moderate sedation requiring opioids or inability to cooperate.
- **MNH** performs RIG and PIG through Interventional Radiology. **It is currently the only site with routine anesthesiologist involvement for all gastrostomy procedures.**

Patient factors:

- The MNH population is reported to have more medically complex/high-risk patients, with nurse-reported estimates indicating that >75% of patients are ASA III–IV, compared with less than 25% at RVH and MGH; **these are not based on systematic ASA assessments.**
- However, the available information does not establish that patients at RVH/MGH are inherently at lower risk, nor does it provide a validated threshold for determining when anesthesiologist involvement is required.

Organizational factors:

- Sites also differ in local organizational factors, including nursing competencies, interventional radiology expertise and infrastructure, and procedural volume needed to maintain competencies.

Thus, the variation across MUHC sites appears to reflect a combination of procedural, patient and organizational factors, as well as established local practice patterns.

4.2.2 Current practice at the CHUM

- Data provided by the interventional endoscopy service indicate that a higher proportion of gastrostomy procedures are performed endoscopically than radiologically.
- An ASA assessment is routinely performed for patients with neurological disorders; the majority are classified as ASA III.
- For patients with amyotrophic lateral sclerosis, sedation is administered by nursing staff upon medical prescription, using medications such as midazolam or fentanyl, depending on the patient's general condition.
- Nursing staff responsible for administering sedation hold a basic nursing qualification supplemented by specific endoscopy training covering sedation administration and post-procedural monitoring.
- Significant cardiorespiratory events occurring during or shortly after the gastrostomy (e.g., desaturation or the need for airway intervention, hypotension, arrhythmia) are reported to be rare.

This represents a different model of care and demonstrates that **a neurological diagnosis alone does not universally determine the need for physician anesthesiology support**. However, **the information available to TAU does not permit a direct comparison of care models between the CHUM and MUHC;** differences between institutions, including patient selection, procedural technique, sedation protocols, staffing models and escalation resources, must be considered when interpreting this comparison.

5. DISCUSSION

5.1 What does the evidence establish?

Available evidence does **not** answer the organizational question of whether an anesthesiologist should routinely be present for every gastrostomy in a neurological patient.

The evidence supports the use of individualized assessment to determine the appropriate level of sedation and anesthesia for gastrostomy.

5.2 What does current MUHC practice suggest?

The observed variation in anesthesiologist involvement across MUHC sites appears to reflect a combination of **procedural, patient and organizational factors**.

The MNH population includes patients with substantial neurological and neuromuscular disease, including advanced ALS, stroke, impaired neuromuscular function, and significant respiratory dependence, for whom sedation may require additional support.

Although patients undergoing gastrostomy at the RVH and MGH sites are reported to have a lower proportion of severe neurological or neuromuscular impairment, **the available information does not establish that patients at these sites are inherently at lower risk,** nor does it provide a validated threshold for determining when anesthesiologist involvement is required.

Finally, organizational factors, including the availability of nurses trained in sedation-related monitoring, access to interventional radiology expertise and infrastructure, and sufficient procedural volume to maintain competencies, differ across sites and may contribute to variation in practice.

Therefore, variation across MUHC sites appears to reflect a combination of procedural, patient and organizational factors, as well as established local practice patterns, rather than a single MUHC-wide approach to anesthesiologist involvement.

5.3 Clinical risk versus organizational model

Given that the available literature does not establish either a clinical benefit from routine anesthesiologist involvement or a universal requirement for anesthesiologist presence during gastrostomy in patients with neurological disorders, the question can therefore be reframed from:

" Is the presence of an anesthesiologist clinically indicated for every gastrostomy procedure in neurological patients?"

to:

"Which organizational model can appropriately support neurological patients, taking into consideration patient complexity and available expertise and resources?"

This framing is more consistent with the available evidence and allows patient safety and resource considerations to be addressed together.

5.4 Considerations for a standardized approach

A standardized MUHC approach could consider:

Patient factors

- respiratory muscle weakness;
- dependence on non-invasive or invasive ventilation;
- airway difficulty;
- impaired airway protection;
- significant cardiopulmonary comorbidity;
- ASA classification; and
- ability to tolerate supine positioning.

Procedure factors

- gastrostomy technique;
- anticipated sedation depth;
- procedural complexity;
- expected duration; and
- likelihood of requiring airway or ventilatory intervention.

Organizational factors

- appropriately trained procedural physician;
- nursing monitoring and sedation competencies;
- immediate access to airway rescue;
- emergency response capability; and
- availability of anesthesiology consultation when required.

6. CONCLUSIONS

- The systematic review identified **no direct comparative evidence** establishing whether gastrostomy procedures in patients with neurological disorders have better outcomes when performed with anesthesiologist involvement, or establishing the safety of performing these procedures without such support.
- Relevant guidelines similarly do not mandate anesthesiologist presence, instead emphasizing appropriate sedation according to patient characteristics, procedure and

local expertise. Importantly, **the absence of a recommendation for routine anesthesiologist involvement does not preclude involvement for individual high-risk patients, and does not imply that gastrostomy can be performed by the procedural physician alone; appropriately trained personnel for sedation and monitoring remain essential.**

- At the MUHC, practice varies considerably across sites, with routine anesthesiologist involvement at MNH whereas RVH and MGH use nurse-administered sedation with selective anesthesiologist involvement. This variation occurs in the context of differences in patient risk, procedure volumes, expertise and organizational models.
- **Overall, the available evidence does not establish a clinical benefit from routine anesthesiologist involvement or provide a validated threshold for determining when it is required.** The evidence supports a risk-based, team-based approach to sedation and monitoring.

7. TAU CONSIDERATIONS

The available evidence does not establish a universal requirement for anesthesiologist involvement during gastrostomy tube insertion. Variation across MUHC sites appears to reflect a combination of procedural, patient and organizational factors, as well as established local practice patterns.

We therefore recommend consideration of the following:

1. Risk-based anesthesiologist involvement

The evidence does not establish a universal requirement or clinical benefit for anesthesiologist involvement during gastrostomy for neurological patients. At the same time, MNH serves a population with a higher proportion of patients classified as ASA III–IV, and some patients may have significant respiratory, airway or neurological vulnerability.

A standardized MUHC approach could therefore consider **risk-based criteria for anesthesiologist involvement**, incorporating respiratory/airway risk, anticipated sedation requirements, patient ability to cooperate, previous sedation difficulties, procedural complexity, and local resources.

2. Maintaining sedation competencies

The relatively low volume of gastrostomy procedures at MNH presents a challenge for maintaining nursing competencies in sedation-related care. One potential approach would be to maintain these competencies through participation in other procedures requiring sedation at MNH and/or through training and clinical exposure at RVH or MGH.

3. Inter-site care pathways

For selected neurologically stable patients who can be safely transported, the MUHC could explore the feasibility of **transferring patients from MNH to MGH for gastrostomy placement by the GI team**. This could leverage existing GI expertise and nursing sedation competencies at MGH. Such a pathway would require assessment of patient eligibility, transport considerations, procedural capacity and coordination between sites.

APPENDICES

APPENDIX A OVERVIEW OF GASTROSTOMY PROCEDURES

Table A-1. Procedural variation according to gastrostomy technique

Dimension	PEG (Percutaneous Endoscopic Gastrostomy)	RIG (Radiologically Inserted Gastrostomy)	PIG (Per-oral Image-guided Gastrostomy)
Core technique	Endoscopic transoral placement; tube pulled through mouth and out abdominal wall (pull-PEG)	Pure percutaneous, fluoroscopic placement; tube pushed through abdominal wall after gastropexy	Per-oral, fluoroscopy-guided over-the-wire push placement of a large-bore tube; no gastropexy
Imaging	Endoscopy	Fluoroscopy; T-fastener gastropexy commonly used	Fluoroscopy only
Anesthesia/ sedation	Conscious sedation (e.g., midazolam + pethidine)	Can be done with local anesthesia alone (advantage in neuromuscular weakness)	Can be done with minimal sedation or local anaesthetic alone
Tube size/type	Large (up to 24 F pull-type); internal bumper/mushroom	Small-bore (10.5–12 F); higher blockage risk	Large (20 F) over-the-wire push tube with silicone internal bolster; external fixation disc
Situations favouring method	When endoscopy readily available; large-bore tube desired	Effective when PEG failed or endoscopy contraindicated; low infection rate	Effective when PEG failed or endoscopy contraindicated

From Laasch et al.[2]

APPENDIX B ARTICLE SEARCH STRATEGY

Database(s): **Ovid MEDLINE(R) and Epub Ahead of Print and In-Process, In-Data-Review & Other Non-Indexed Citations and Daily** 1946 to July 28, 2026

Table B-1. Medline search strategy

#	Searches	Results
1	Gastrostomy/ and (exp Endoscopy/ or Radiology, Interventional/)	3071
2	(percutaneous adj3 endoscop* adj3 gastrostom*).tw,kf.	4326
3	((radiolog* or per-oral or image-guided) adj3 gastrostom*).tw,kf.	311
4	1 or 2 or 3	5902
5	Anesthesia/ or exp Anesthesia, Conduction/ or Anesthesia, Intravenous/ or Neuroanesthesia/ or Conscious Sedation/ or exp Analgesia/ or Anesthetics/ or exp Anesthetics, Local/	299607
6	(an?esthe* or analgesi* or sedat*).tw,kf.	662735
7	5 or 6	781165
8	4 and 7	439
9	((nurs* or non-an?esthetist* or non-an?esthesiolog*) and (sedat* or an?esthetic* or an?esthesia* or propofol*)).ti. and (endoscop* or gastrostom*).tw.	134
10	8 or 9	570
11	(exp infant/ or exp child/ or adolescent/ or exp pediatrics/) not exp adult/	2353662
12	(newborn* or new-born* or neonat* or neo-nat* or infan* or child* or adolesc* or paediatr* or pediatr* or baby* or babies* or toddler* or kid or kids or boy* or girl* or juvenile* or teen* or youth* or pubescen* or preadolesc* or prepubesc* or preteen* or tween*).ti.	2028548
13	(neonat* or infan* or child* or adolescen* or pediatric* or paediatric*).jw.	887955
14	11 or 12 or 13	3212107
15	10 not 14	465
16	("22645103" or "25290682" or "40428226").ui.	3
17	15 and 16	3

PRISMA Flow diagram

The diagram maps out the exact number of records or studies that were identified, screened, checked for eligibility, and ultimately included or excluded, along with the reasons why studies were left out.

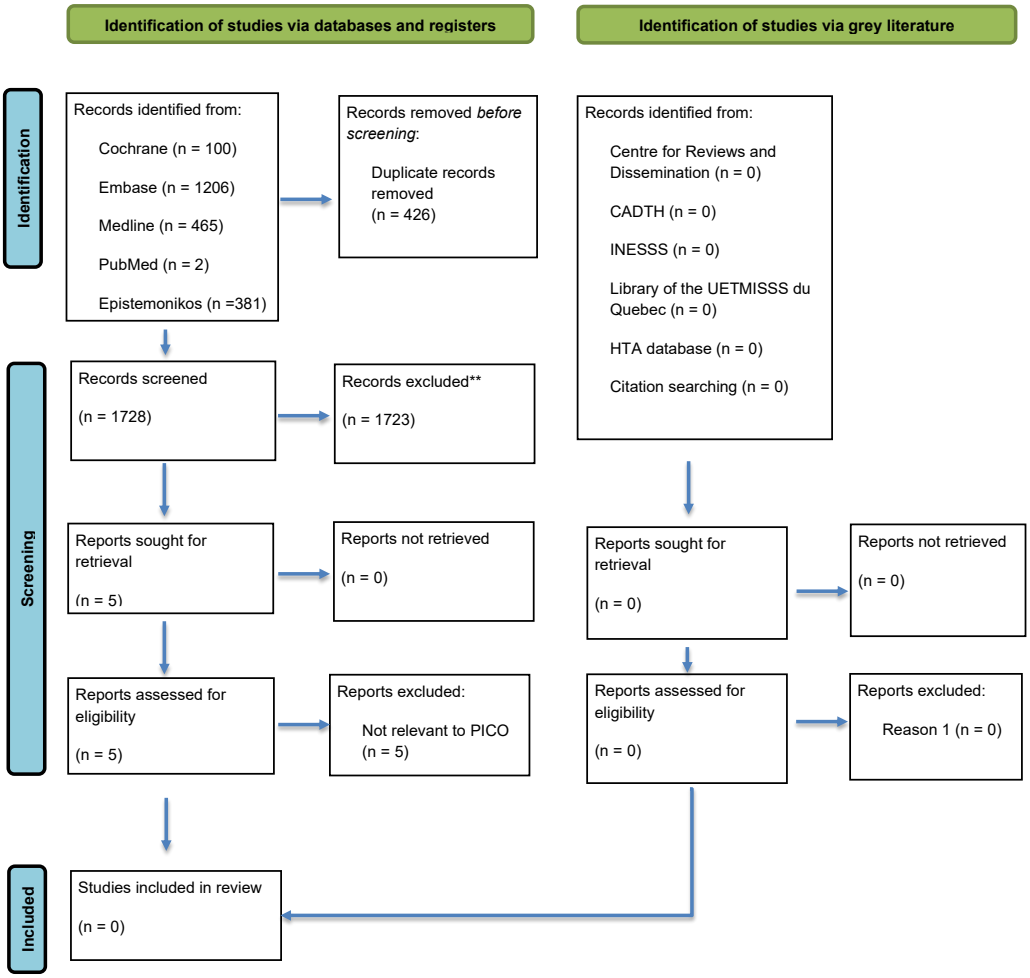


Figure B-1. PRISMA flow diagram

APPENDIX C INTERVIEW GUIDE AND SURVEY QUESTIONS

Local experts consulted for the survey
The following local experts contributed information on current practice through correspondence, interviews, and/or online surveys:

Table C-1. Local experts consulted

Name	Role / area of expertise	Site
Dr. Marcelo Lannes	Site Director, Department of Anesthesia	MNH
Dr. Carlos Torres	Neuroradiology	MNH
Christine Lefebvre	Vice-President, MUHC Council of Nurses	MUHC
Dorothy Hum	Nursing Professional Development Educator; OR, Neuroradiology, Ambulatory Care Services	MNH
Kimberly Ann Gutierrez	Nurse Manager, Endoscopy & Interventional Radiology	RVH/MGH
Collin-Michael Antonio	Nurse Manager, Interventional Neuroradiology	MNH
Melissa Mercier	Interventional Neuroradiology Nurse Clinician / Interim NPDE	MNH
Monique Donelle	Temporary Nurse in Charge, Gastroenterology	RVH
Vilma Bodo	RN in Charge, Medical Imaging	RVH
Joyce Cotiangco	RN in Charge, Medical Imaging	MGH

Interview Guide: Key Themes Explored
Interviews with clinical and operational experts used a semi-structured approach. Questions were adapted to the respondent's role and focused on the following themes:

Table C-2. Key themes explored

Theme	Areas explored
Current practice and workflow	• Current process for requesting and performing PEG, RIG and/or PIG; • roles and responsibilities of the procedural, nursing and anesthesiology teams; • current sedation/anesthesia approach; • decision-making and scheduling processes.
Clinical rationale for anesthesiology involvement	• Rationale for routine or selective anesthesiology support; • perceived patient-safety considerations; • role of patient characteristics, procedural complexity and sedation requirements.
Patient selection and risk stratification	• Characteristics of patients considered to require anesthesiology support; • circumstances in which support may be avoided; • existence of formal criteria, protocols or other approaches to risk stratification.
Patient population and procedural complexity	• Changes in patient population or case complexity over time; • differences between neurological and other patient populations; • differences between short-term and longer-term indications where relevant.
Safety and complications	• Experience with complications;

Theme	Areas explored
	• perceived relationship between complications and the procedure or sedation; • monitoring of complications and safety outcomes;0 • factors considered relevant to patient safety.
Organizational and resource considerations	• Anesthesiology capacity and competing demands; • scheduling and workflow; • procedure volumes; • availability of trained staff; • procedural expertise; • coordination between services; • factors contributing to inefficiencies.
Alternative models of care	• Experience with selective rather than routine anesthesiology involvement; • models used at other MUHC sites or centres; • potential role of nurse-led sedation/monitoring and multidisciplinary support models.
Future-state opportunities	• Potential changes to maintain patient safety while optimizing resources; • development of risk-based criteria or protocols; • Opportunities to strengthen local expertise, training and team-based care.

Online Questionnaire: Review of Current Gastrostomy Practice at the MUHC
The questionnaire was developed to characterize current gastrostomy practice, sedation approaches, anesthesiology involvement, workflow, and safety considerations across MUHC sites.

Table C-3. Online survey questions

Section / Question	Response options / fields
SECTION 1 — SITE AND RESPONDENT INFORMATION	
1. Which site are you completing this questionnaire for?*	☐ Royal Victoria Hospital (RVH) ☐ Montreal General Hospital (MGH) ☐ Montreal Neurological Hospital (MNH)
2. Name*	_____
3. Role*	_____
SECTION 2 — PROCEDURE TYPE	
4. Which gastrostomy procedures are performed at your site?* *Select all that apply.*	☐ PEG ☐ RIG/PRG ☐ PIG ☐ Surgical gastrostomy
5. Approximately how many gastrostomy procedures are performed annually?*	☐ <25 ☐ 25–50 ☐ 51–100 ☐ 101–200 ☐ >200 ☐ Don't know
SECTION 3 — PATIENT POPULATION	
6. Approximately what proportion of patients undergoing gastrostomy at your site fall into each ASA physical status category?*	See response matrix below.
ASA category	<25% | 25–50% | 50–75% | >75% | Don't know
ASA I	☐ | ☐ | ☐ | ☐ | ☐
ASA II	☐ | ☐ | ☐ | ☐ | ☐
ASA III	☐ | ☐ | ☐ | ☐ | ☐

Section / Question	Response options / fields
ASA IV	☐ | ☐ | ☐ | ☐ | ☐
7. What are the most common indications for gastrostomy at your site?* *Select all that apply.*	☐ Stroke ☐ Neurodegenerative disease ☐ Head and neck cancer ☐ Esophageal obstruction ☐ Trauma ☐ Chronic aspiration ☐ Other: _____
SECTION 4 — PROCEDURE SELECTION	
8. Which service primarily performs each procedure at your site?*	See response matrix below.
Procedure	Radiology | Gastroenterology | Interventional Radiology | Surgery | Not performed at site
PEG	☐ | ☐ | ☐ | ☐ | ☐
RIG/PRG	☐ | ☐ | ☐ | ☐ | ☐
PIG	☐ | ☐ | ☐ | ☐ | ☐
9. What factors influence procedure selection?* *Select all that apply.*	☐ Upper GI obstruction ☐ Airway concerns ☐ Patient comorbidities ☐ Need to avoid sedation ☐ Previous failed PEG ☐ Institutional protocol ☐ Operator preference ☐ Equipment availability ☐ Other: _____
SECTION 5 — SEDATION	
10. For each procedure performed at your site, what level of sedation is most commonly used in ASA I–II patients?*	See response matrix below.
Procedure	Analgesia only | Local anesthesia only | Moderate sedation | Deep sedation | General anesthesia | Not performed at site
PEG	☐ | ☐ | ☐ | ☐ | ☐ | ☐
RIG/PRG	☐ | ☐ | ☐ | ☐ | ☐ | ☐
PIG	☐ | ☐ | ☐ | ☐ | ☐ | ☐
11. For each procedure performed at your site, what level of sedation is most commonly used in ASA III patients?*	See response matrix below.
Procedure	Analgesia only | Local anesthesia only | Moderate sedation | Deep sedation | General anesthesia | Not performed at site
PEG	☐ | ☐ | ☐ | ☐ | ☐ | ☐
RIG/PRG	☐ | ☐ | ☐ | ☐ | ☐ | ☐
PIG	☐ | ☐ | ☐ | ☐ | ☐ | ☐
12. For each procedure performed at your site, what level of sedation is most commonly used in ASA IV patients?*	See response matrix below.
Procedure	Analgesia only | Local anesthesia only | Moderate sedation | Deep sedation | General anesthesia | Not performed at site
PEG	☐ | ☐ | ☐ | ☐ | ☐ | ☐
RIG/PRG	☐ | ☐ | ☐ | ☐ | ☐ | ☐
PIG	☐ | ☐ | ☐ | ☐ | ☐ | ☐
13. Approximately what percentage of patients receive general anesthesia during	☐ Never ☐ <10% ☐ 10–25%

Section / Question	Response options / fields
gastrostomy tube insertion procedures?*	☐ 26–50% ☐ >50% ☐ Don't know
14. Under what circumstances is general anesthesia used?* *Select all that apply.*	☐ Anticipated difficult airway ☐ Severe respiratory disease ☐ Severe obstructive sleep apnea (OSA) ☐ Morbid obesity ☐ Failed previous sedation ☐ Patient unable to cooperate ☐ Institutional protocol ☐ Other: _____
SECTION 6 — ANESTHESIOLOGY INVOLVEMENT	
15. Who most commonly administers sedation during each procedure performed at your site?*	See response matrix below.
Procedure	Procedural physician | Registered nurse | Nurse practitioner | Anesthesiologist | Not performed at site
PEG	☐ | ☐ | ☐ | ☐ | ☐
RIG/PRG	☐ | ☐ | ☐ | ☐ | ☐
PIG	☐ | ☐ | ☐ | ☐ | ☐
16. Who most commonly provides continuous patient monitoring during each procedure?*	See response matrix below.
Procedure	Procedural physician | Registered nurse | Nurse practitioner | Anesthesiologist | Other | Not performed at site
PEG	☐ | ☐ | ☐ | ☐ | ☐ | ☐
RIG/PRG	☐ | ☐ | ☐ | ☐ | ☐ | ☐
PIG	☐ | ☐ | ☐ | ☐ | ☐ | ☐
17. If an anesthesiologist is routinely present during PEG, RIG/PRG, or PIG procedures, which types of patients receive anesthesiology support?*	
SECTION 7 — WORKFLOW AND SAFETY	
18. Please indicate the average procedure duration, in minutes, for each procedure performed at your site.*	PEG: _____ min RIG/PRG: _____ min PIG: _____ min
19. Which complications are commonly encountered?* *Select all that apply.*	☐ Pain requiring intervention ☐ Oxygen desaturation ☐ Airway intervention ☐ Aspiration ☐ Hypotension ☐ Bleeding ☐ Procedure aborted ☐ Transfer to operating room ☐ Other: _____
SECTION 8 — ADDITIONAL COMMENTS	
20. Please provide any additional information that would help to better understand current clinical practice at your site.	

Note: *Questions marked with an asterisk (*) were required in the original online questionnaire.*

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